# APPENDIX G. ESTABLISHING AN OFFSET FEE BASED ON THE COST OF STORMWATER MANAGEMENT

## TECHNICAL MEMO

To: Critical Areas Commission
From: Center for Watershed Protection

Re: Establishment of an Offset Fee for a Pound of Total Phosphorus Removed

**Recommendation:** Local governments should set an offset fee to fully recover the costs of stormwater management. Estimates of the cost of stormwater management are detailed within this memo and are based on either the equivalent cost method or the stormwater retrofit method, and escalate each year based on the construction cost index provided by Engineering News Record (2003).

**Background:** Until recently, there has been limited cost data available to estimate stormwater treatment costs. Brown and Schueler (1997) evaluated actual costs for 73 stormwater facilities in the mid-Atlantic region, and developed cost equations and cost per cubic foot of water quality storage provided. This study found that the costs to construct stormwater treatment at small sites (less than five acres) were dramatically greater than larger sites. This is an important finding since our initial research indicates that the vast majority of critical area stormwater applications consist of these smaller sites.

**Developing an Offset Fee:** We provide the basis for setting an offset fee that fully recovers the cost to remove phosphorus from a one acre of impervious cover, using two different methods to estimate costs. The first method calculates the equivalent cost to construct a stormwater treatment practice on the same site, whereas the second method calculates the cost to local government to construct a stormwater retrofit on a large site elsewhere in the Critical Area.

Basic Assumptions in Both Methods

1. P loading rate for one acre of impervious cover with C= 0.3 mg/l = 2.33 pounds/year

2. Assume 45% TP removal rate for BMP applied = 1.05 pound removed per year.

*Equivalent Cost Method.* Two estimates were prepared to compute the cost of constructing an equivalent stormwater practice on the existing site.

The first estimate uses Schueler (1997) overall construction cost equations for small sites which yields a median value of $20,000 per acre of impervious area treated. This cost must be updated to account for construction cost inflation since 1996, as measured by change in

Engineering News Record's construction cost index between December 1996 and July 2003. As a result the base construction cost must be multiplied by a factor of 1.19.

Next the costs for design, engineering and permitting (DEP) must be factored in. For these costs, we rely on cost surveys by Brown and Schueler (1997), which indicate that base construction cost must be multiplied by 1.32 to account for DEP related costs.

Thus, under this estimation method, the total cost to treat one acre of impervious cover would be $31,416.00. If we divide this by the 1.05 pounds of phosphorus removed by the practice, **we get a cost of about $29,920 per pound of phosphorus removed.**

The second method used to derive the equivalent cost of stormwater treatment is to use the cost equations for actual bioretention and filter practices, which are presented in Schueler and Brown (1997). These indicate the cost for bioretention to be $6.40 per cubic foot treated and for other filters $5.00 per cubic foot treated. Using an average of the two, we get $5.70 per cubic foot of stormwater treated as construction cost. After this cost is adjusted for construction cost inflation and DEP costs (per the same methods), we get a final cost of $8.95 per cubic foot treated.

This unit cost must then be multiplied by the 3267 cubic feet of stormwater that are produced from one acre of impervious cover, per the Maryland water quality sizing criteria. This yields a total cost of about $29,234 per acre of impervious area treated. If we divide this by the 1.05 pounds of phosphorus removed by the practice, **we get a cost of about $27,842 per pound of phosphorus removed.**

Based on these two methods, **the equivalent cost of constructing stormwater practices is estimated to be about $ 29,000 per pound of phosphorus removed, exclusive of maintenance.**

*Stormwater Retrofit Cost Method*. The second way to look at offset fees is to estimate the cost to a local government to remove the same pound of phosphorus using a larger stormwater retrofit elsewhere in the community. This approach takes advantage of the economies of scale inherent when treating larger sites (e.g., 5 to 100 acres in size). Local governments who construct stormwater retrofits want to ensure that all their costs are recovered: base construction, design and engineering, retrofit inventories and construction management. For these costs, we have recent unit cost data for retrofits from Brown (2003), as follows:

| | Cost | Description |
|---|---|---|
| a | $ 1,400.00 | Pro-rated cost for subwatershed analysis/retrofit inventory cost to find candidate site |
| b | $ 3,140.00 | Design, engineering and permitting cost |
| c | $12,550.00 | Cost per impervious acre treated: average of new facility and pond modification |

| | | |
|---|---|---|
| d | $ 1,300.00 | local government cost to administer and bid retrofit assessment, design and construction (7.5% of a+b+c) |

Total: $18,390 per impervious acre treated. When divided by the 1.05 pounds of phosphorus removed by the retrofit, we get **$17,500 per pound of removed, excluding maintenance.**

**Maintenance Costs:** Both methods have neglected the cost of maintaining stormwater practices. Several municipalities suggest that any offset fee should fully recover future maintenance costs. Estimated maintenance costs are estimated to be 3 to 5% of base construction cost per year (Brown and Schueler, 1997). Using a midpoint value of 4%, and assuming the present value of a ten year stream of maintenance costs could capitalize future maintenance costs, suggests that the following additional costs should be captured in the offset fee.

*Equivalent Cost Method:*
$29,000 + 9,400 for maintenance = **$38,400 per pound of P removed**

*Stormwater Retrofit Method*
$17,500 + 5,000 for maintenance = **$22,500 per pound of P removed**